DRAFT HEALTH ADVISORY:

SAFE EATING GUIDELINES FOR FISH AND SHELLFISH FROM LAKE BERRYESSA AND PUTAH CREEK (NAPA, YOLO, AND SOLANO COUNTIES)

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EXECUTIVE SUMMARY

The Office of Environmental Health Hazard Assessment (OEHHA), formerly part of the Department of Health Services (DHS) but now in the California Environmental Protection Agency, issued a health advisory in 1987 for sport fish from Lake Berryessa (Napa County) based on mercury contamination in edible fish tissue collected from the lake (Appendix I). Since the advisory was issued, additional data have been collected for Lake Berryessa as well as for Putah Creek. The Central Valley Regional Water Quality Control Board (CVRWQCB) compiled a large dataset comprised of historical and more recently collected fish tissue data. OEHHA reviewed this dataset and compared it to the original datasets from which it was derived. Data suitable for issuing fish consumption advisories were selected out and verified before using them to update the advisory for Lake Berryessa, and to determine whether there may be potential adverse health effects associated with consuming sport fish from Putah Creek.

Mercury is a trace metal that can be toxic to humans and other organisms. Mercury occurs naturally in the environment, and is also redistributed in the environment as a result of human activities such as mining and the burning of fossil fuels. Once mercury is released into the environment, it cycles through land, air, and water. In aquatic systems, it undergoes chemical transformation to the more toxic organic form, methylmercury, which accumulates in fish and other organisms. More than 95 percent of the mercury found in fish occurs as methylmercury, which is a highly toxic form of the element. Consumption of fish is the major route of exposure to methylmercury in the United States. For more information on mercury, see Appendix II.

The critical target of methylmercury toxicity is the nervous system, particularly in developing organisms such as the fetus and young children. Significant methylmercury toxicity can occur to the fetus during pregnancy even in the absence of symptoms in the mother. In 1985, the United States Environmental Protection Agency (U.S. EPA) set a reference dose (that is the daily exposure likely to be without significant risks of deleterious effects during a lifetime) for methylmercury of $3x10^{-4}$ milligrams per kilogram of body weight per day (mg/kg-day), based on central nervous system effects (ataxia, or loss of muscular coordination; and paresthesia, a sensation of numbness and tingling) in adults. This reference dose (RfD) was lowered to $1x10^{-4}$ mg/kg-day in 1995 (and confirmed in 2001), based on developmental neurologic abnormalities in infants exposed *in utero*. Because OEHHA finds convincing evidence that the fetus is more sensitive than adults to the neurotoxic effects of mercury, but also recognizes that fish can play an important role in a healthy diet, OEHHA chooses to use both the current and previous U.S. EPA reference doses for two distinct population groups. In this advisory, the current RfD based on effects in infants will be used for women of childbearing age and children aged 17 years and younger. The previous RfD, based on effects in adults, will be used for women beyond their childbearing years and men.

Sufficient data were available to characterize the concentrations of mercury and issue safe eating guidelines for the following species and locations: channel catfish, white catfish, largemouth bass, rainbow trout, and chinook (king) salmon in Lake Berryessa; and channel catfish, white catfish, largemouth bass, Sacramento blackfish, Sacramento sucker, bluegill, carp, and crayfish in Putah Creek. Additional data for other species were considered and compared to federal advice to develop health-protective guidelines whenever possible. Mercury concentrations were generally lower in fish from Putah Creek compared to Lake Berryessa (for those species

collected in both water bodies), and the data supported different advice for Lake Berryessa and Putah Creek for several of the species. Although it might be easier for fish consumers to follow the same guidelines for both water bodies, we chose to provide different guidelines as they generally allow for more consumption of fish from Putah Creek and thus provide a safer option for sport fish consumers. Anyone wishing to adhere to a simpler set of guidelines could choose to apply the more restrictive guidelines to both water bodies.

Mercury concentrations were compared to guidance tissue levels for methylmercury, which are designed so that individuals consuming no more than a preset number of meals should not exceed the RfD for this chemical. Evaluation of data and comparison with guidance tissue levels for methylmercury indicated that fish consumption guidelines were appropriate for Lake Berryessa and Putah Creek. "Safe eating guidelines" provide information to fish consumers as to which fish species have high mercury levels and whose consumption should be restricted or avoided altogether, as well as low-mercury fish that may be consumed frequently as part of a healthy diet. All individuals, especially women of childbearing age and children aged 17 years and younger, are advised to follow the safe eating guidelines to ensure that methylmercury ingestion does not exceed the reference dose. To help sport fish consumers achieve this goal, OEHHA has developed the guidelines contained in this report.

The revised guidelines for Lake Berryessa differ in several ways from the original advisory issued in 1987. The definition of the sensitive population has been expanded to include all women of childbearing age, in order to reduce the chance that mercury may accumulate in their bodies during the months and years preceding pregnancy. Additionally, the guidelines now include all children 17 years and younger in this sensitive population, as recent studies have shown that the still developing adolescent brain is more sensitive to toxins than is the adult brain. Whereas the previous advice instructed women who are pregnant or might become pregnant and young children not to eat any fish from Lake Berryessa, the new draft guidelines identify types of fish with lower levels of mercury that can be eaten by this population. With a wealth of data indicating that consumption of fish low in contaminants confers numerous health benefits to the fetus, children and adults, OEHHA's new safe eating guidelines provide for and encourage consumption of such fish by all consumers. The new draft guidelines also present the recommended consumption in meals per week or meals per month rather than in pounds of fish. Meal sizes should be adjusted to body weight as described in the advisory table.

For general advice on how to limit your exposure to chemical contaminants in sport fish (*e.g.*, eating smaller fish of legal size), see the California Sport Fish Consumption Advisories (http://www.oehha.ca.gov/fish.html) or Appendix III. Site-specific advice for other California water bodies can be found online at: http://www.oehha.ca.gov/fish/so_cal/index.html. Unlike the case for many organic contaminants, however, various cooking and cleaning techniques will not reduce the methylmercury content of fish.

SAFE EATING GUIDELINES
FISH CONSUMPTION AT LAKE BERRYESSA

Fish are nutritious and should be part of a healthy, balanced diet. It is important, however, to choose your fish wisely. OEHHA recommends that you choose fish to eat that are low in mercury, including the following fish caught from Lake Berryessa.

BEST CHOICES (Up to 3 times a week)
Women of childbearing age and children 17 years and younger:
There are no best choices for this population at Lake Berryessa
Women beyond childbearing age and men:
Trout or kokanee

Because some other types of fish from Lake Berryessa contain higher levels of mercury, OEHHA provides the following recommendations that you can follow to reduce the risks from exposure to methylmercury in fish.

CAUTION	
Women of childbearing age and children 17 years and younger:	
AVOID (No more than one meal a month)	Black bass, catfish, and chinook (king) salmon
EAT SPARINGLY (No more than one meal a week)	Bluegill or other sunfish, trout, or kokanee
Women beyond childbearing age and men:	
EAT SPARINGLY (No more than one meal a week)	Black bass, catfish, bluegill or other sunfish, or chinook (king) salmon

- **CONTACT WITH THE WATER IS SAFE.**
- **EAT SMALLER FISH OF LEGAL SIZE**. Fish accumulate mercury as they grow.
- **SERVE SMALLER MEALS TO CHILDREN**. Meal size is assumed to be 8 ounces for a 160-pound adult. If you weigh more or less than 160 pounds, add or subtract one ounce to your meal size, respectively, for each 20-pound difference in body weight.
- **DO NOT COMBINE FISH CONSUMPTION ADVICE**. If you eat multiple species or catch fish from more than one area, the recommended guidelines for different species and locations should not be combined.
- **CONSIDER YOUR TOTAL FISH CONSUMPTION**. Fish from many sources (including stores and restaurants) can contain elevated levels of mercury and other contaminants. If you eat commercial and/or sport fish with lower contaminant levels, you can safely eat more fish. The American Heart Association recommends that healthy adults eat at least two servings of fish per week. Commercial fish such as shrimp, king crab, scallops, farmed catfish, wild ocean salmon, oysters, tilapia, flounder, and sole generally contain some of the lowest levels of mercury, as do the local fish in the "Best Choices" table.
- **FISH FROM MANY OTHER WATER BODIES ARE KNOWN OR SUSPECTED TO HAVE ELEVATED MERCURY LEVELS**. Not all water bodies in California have been tested. It is recommended that fish from places without an advisory be eaten sparingly.

SAFE EATING GUIDELINES
FISH CONSUMPTION AT PUTAH CREEK

Fish are nutritious and should be part of a healthy, balanced diet. It is important, however, to choose your fish wisely. OEHHA recommends that you choose fish to eat that are low in mercury, including the following fish caught from Putah Creek.

BEST CHOICES **(Up to 3 times a week)**
Women of childbearing age and children 17 years and younger:
Trout or Sacramento blackfish
Women beyond childbearing age and men:
Trout*, Sacramento blackfish*, bluegill or other sunfish, catfish (including bullheads), sucker, carp or goldfish, or crayfish

***** May be eaten daily by women beyond childbearing age and men

Because some other types of fish from Putah Creek contain higher levels of mercury, OEHHA provides the following recommendations that you can follow to reduce the risks from exposure to methylmercury in fish.

EAT SPARINGLY **(No more than one meal a week)**
Women of childbearing age and children 17 years and younger:
Black bass, bluegill or other sunfish, carp or goldfish, catfish (including bullheads), crappie, sucker, hitch, or crayfish
Women beyond childbearing age and men:
Black bass, crappie, or hitch

- **CONTACT WITH THE WATER IS SAFE.**
- **EAT SMALLER FISH OF LEGAL SIZE**. Fish accumulate mercury as they grow.
- **SERVE SMALLER MEALS TO CHILDREN**. Meal size is assumed to be 8 ounces for a 160-pound adult. If you weigh more or less than 160 pounds, add or subtract one ounce to your meal size, respectively, for each 20-pound difference in body weight.
- **DO NOT COMBINE FISH CONSUMPTION ADVICE**. If you eat multiple species or catch fish from more than one area, the recommended guidelines for different species and locations should not be combined.
- **CONSIDER YOUR TOTAL FISH CONSUMPTION**. Fish from many sources (including stores and restaurants) can contain elevated levels of mercury and other contaminants. If you eat commercial and/or sport fish with lower contaminant levels, you can safely eat more fish. The American Heart Association recommends that healthy adults eat at least two servings of fish per week. Commercial fish such as shrimp, king crab, scallops, farmed catfish, wild ocean salmon, oysters, tilapia, flounder, and sole generally contain some of the lowest levels of mercury, as do the local fish in the "Best Choices" table.
- **FISH FROM MANY OTHER WATER BODIES ARE KNOWN OR SUSPECTED TO HAVE ELEVATED MERCURY LEVELS**. Not all water bodies in California have been tested. It is recommended that fish from places without an advisory be eaten sparingly.